Attorney Docket No.: 119929-1028 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Harold R. Garner
Divisional of Serial No.:	09/326,526
Filed:	June 4, 1999
Group Art Unit:	2872
Examiner:	James Phan
For:	DIGITAL OPTICAL CHEMISTRY MICROMIRROR

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Linda L. Gibson

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REQUEST BY APPLICANT FOR INTERFERENCE
PURSUANT TO 37 C.F.R. § 1.604
AND
PRELIMINARY AMENDMENT

Sir:

Please find below a Request By Applicant For Interference Pursuant To 37 C.F.R. § 1.604 and Preliminary Amendment that accompanies the request for filing a Divisional Application under 37 CFR 1.53(b) filed herewith. Please amend the divisional patent application filed herewith as follows:

IN THE SPECIFICATION:

On page 2, please add the following reference to the divisional application:

--This application is a Divisional Application of pending United States Patent Application Serial Number 09/326,526, filed on June 4, 1999, which claims priority to United States Provisional Patent Application Serial No. 60/087,948, filed June 4, 1998.--

IN THE CLAIMS:

Cancel in this divisional application original claims 1 through 38 of pending United States patent application Serial Number 09/326,526 before calculating the filing fee.

Please add new claims:

39. Apparatus for use in synthesis of arrays of DNA probes, polypeptides, and the like, comprising:

(a) a substrate with an active surface on which the arrays may be formed;

(b) an image former providing a high precision, two-dimensional light image projected onto the substrate active surface, comprising:

(1) a light source providing a light beam;

(2) a micromirror device receiving the light beam from the source and formed of an array of electronically addressable micromirrors, each of which can be selectively tilted between one of at least two separate positions, wherein in one of the positions of each micromirror the light from the source incident upon the micromirror is deflected away from an optical axis and in a second of the at least two positions of the micromirror the light is reflected along the optical axis; and

(3) projection optics receiving the light reflected from the micromirrors along the optical axis and imaging the pattern of the micromirrors onto the active surface of the substrate.

40. The apparatus of Claim 39 wherein the micromirror device is formed of a two dimensional array of micromirrors.

41. The apparatus of Claim 39 including a lens for collimating the beam from the light source to provide a collimated beam projected onto the micromirror array at an oblique angle to a main optical axis that extends from the micromirror array to the substrate, and wherein in one position of each micromirror the light is reflected along the optical axis through the projection optics to the substrate and in a second position of each micromirror the light from the source is reflected at an angle off the main axis of the projection system and away from the substrate.

42. The apparatus of Claim 39 wherein the light source provides an output beam to a lens which collimates the output beam, and including a beam splitter positioned between the micromirror array and the projection optics and receiving the collimated beam from the source, the beam splitter reflecting a portion of the beam to the micromirror array and receiving reflected light from the micromirror array along a main optical axis of the apparatus that extends from the micromirror array through the projection optics to the substrate, the beam splitter partially passing the light from the micromirror therethrough to the projection optics to be imaged on the active surface of the substrate.

43. The apparatus of Claim 39 further including a filter receiving the light from the source and which selectively passes only desired wavelengths through to the micromirror array.

44. The apparatus of Claim 39 wherein the substrate is transparent and light from the image former is passed through the transparent substrate to be imaged on the active surface of the substrate which is opposite to the surface which initially receives the light from the image former.

45. The apparatus of Claim 43 further including a flow cell enclosing the active surface of the substrate and having ports for applying reagents into the flow cell which can be flowed over the active surface of the substrate.

46. The apparatus of Claim 39 further including a computer connected to the micromirror device to provide command signals to control the deflection of the mirrors in the micromirror array to provide a desired pattern for projection onto the substrate.

47. The apparatus of Claim 39 wherein the light provided by the light source is in the range of ultraviolet to near ultraviolet wavelengths.

48. The apparatus of Claim 46 including a filter receiving the light from the source which selectively passes wavelengths in the ultraviolet and near ultraviolet and blocks longer wavelengths including infrared.

49. The apparatus of Claim 47 wherein the filter includes a dichroic mirror that reflects the selected wavelengths and passes the wavelengths to be blocked.

50. The apparatus of Claim 39 wherein the projection optics include focussing lenses and an adjustable iris, one of the lenses passing light through the adjustable iris and the other lens receiving the light passed through the iris and focussing that light onto the active surface of the substrate.

51. The apparatus of Claim 39 wherein the pattern of the micromirrors that is imaged onto the active surface of the substrate is reduced in size with respect to the size of the array of micromirrors.

52. The apparatus of Claim 39 wherein the projection optics is comprised of telecentric refractive optical elements, and including refractive lenses between the light source and the micromirror device that form a Kohler illumination system.

53. The apparatus of Claim 39 wherein the projection optics is telecentric and is comprised of reflective optical elements.

54. The apparatus of Claim 52 wherein the reflective optical elements include a concave mirror and a convex mirror, the concave mirror reflecting light from the micromirror device to the convex mirror which reflects it back to the concave mirror which reflects the light to the substrate where it is imaged.

55. The apparatus of Claim 53 including a planar mirror that reflects the light from the concave mirror to the substrate.

56. The apparatus of Claim 39 including a flow cell enclosing the active surface of the substrate and having ports for applying reagents into the flow cell which can be flowed over the active surface of the substrate, and a DNA synthesizer connected to supply reagents to the flow cell.

57. The apparatus of Claim 39 including a flow cell having a housing composed of a lower base and upper cover section and a gasket mounted on the base, wherein the substrate is a transparent glass slide secured between the upper cover section and the base to define a sealed reaction chamber between the substrate and the base that is sealed by the gasket, and channels extending through the housing from the input port to the reaction chamber and from the reaction chamber to the output port, the active surface of the substrate facing the sealed reaction chamber.

58. The apparatus of Claim 56 including means for detachably securing the substrate between the lower base and upper cover section to allow the substrate to be replaced.

59. A method of synthesizing two-dimensional arrays of DNA probes comprising the steps of:

(a) providing a substrate with an active surface to which DNA synthesis linkers have been applied;

(b) providing a micromirror device comprising a two-dimensional array of electronically addressable micromirrors, each of which can be selectively tilted between one of at least two separate positions, and providing signals to the micromirror device to select a pattern of the micromirrors in the two-dimensional array which are to reflect light onto the substrate;

(c) projecting light from a source onto the micromirror array and reflecting the light from the mirrors of the micromirror array through projection optics to image the micromirror array onto the active surface of the substrate to illuminate those pixel sites in the array on the substrate active surface which are to be activated to deprotect OH groups thereon to make them available for binding to bases;

(d) providing a fluid containing an appropriate base to the active surface of the substrate and binding the selected base to the exposed sites;

(e) then providing control signals to the micromirror array device to select a new pattern of mirrors that are deflected to reflect light toward the substrate and repeating steps (c) through (e).

60. The method of Claim 58 wherein steps (c) through (e) are repeated a selected number of times to build up a selected number of levels of bases in a two-dimensional probe array on the substrate.

61. The method of Claim 58 wherein a selected nucleotide base is flowed over the active surface in step (d) to bind to selected sites utilizing phosphoramidate DNA synthesis.

REMARKS

The claims of this amendment find support in the application of Garner as filed, specifically, claims 1-38 of the co-pending patent application filed June 4, 1999, Serial No. 09/326,526 (the " '526 application") and claims 1-18 of provisional application filed June 4, 1998, Serial No. 60/087,948. Further support for the claims of this amendment may be found in the above cited applications at page 17, l. 19 - page 25, l. 2, in which the creation of a nucleic and amino acid matrix is described, including the formation of arrays. Further support may be found in Figures 7 and 8 of the 60/087,948 application that demonstrate the chemical conjugation of a dye to an oligonucleotide on a substrate using UV directed oligonucleotide synthesis.

This amendment incorporates claims from Cerrina, et al., as published in International Application WO 99/42813. The WO 99/42813 application claims priority to an application filed in the United States PCT Receiving Office and given the number PCT/US99/03807, filed February 22, 1999, which claims priority to United States Provisional Patent application 60/075,641, filed February 23, 1998.

Applicant presents this Preliminary Amendment in conjunction with a Request by Applicant for Interference Pursuant to 37 C.F.R. § 1.604 wherein Applicant respectfully requests that an interference by declared between this divisional application and the United States counterpart to co-pending patent application PCT/US99/03807. The information required by 37 C.F.R. § 1.604(a) is set forth below under sections that should facilitate consideration by the Examiner.

I. IDENTIFICATION OF THE PATENT APPLICATION THAT INCLUDES SUBJECT MATTER WHICH INTERFERES WITH THE PRESENT APPLICATION

The patent application that claims subject matter which interferes with subject matter claimed herein is believed to be the United States counterpart patent application to published PCT International Publication Number WO 99/42813 entitled "METHOD AND APPARATUS FOR SYNTHESIS OF ARRAYS OF DNA PROBES." The WO 99/42813 application was published on August 26, 1999, which purports on its face to be based on United States provisional patent application 60/075,641 filed February 23, 1998. Wisconsin Alumni Research Foundation is the assignee named on the face of the published application. The United States is not designated on the face of the publication, as such, Applicant believes that a counterpart United States patent application was filed concurrently with the filing of the published application, which is the patent application that interferes with the present application.

II. PRESENTATION OF A PROPOSED COUNT

Attached Appendix A sets forth the proposed count. The proposed phantom count is claim 1 of the '526 application, and was selected after consideration of the subject matter claimed by the respective parties.

The proposed count is at least as broad as claim 1 in the WO 99/42813 application. A phantom count is proposed because different language is used by the respective parties to describe the same invention.

III. IDENTIFICATION OF THE CLAIM OF WO 99/42813 THAT CORRESPONDS TO THE COUNT

Claims 1-42 of the WO 99/42813 application, which Applicant believes corresponds to the claims of the United States counterpart, correspond to the proposed count. Appendix C is a comparison of claim 1 of the WO 99/42813 application and the proposed count.

IV. CLAIMS OF THE PRESENT APPLICATION THAT CORRESPOND TO THE PROPOSED COUNT

Claims 39-60 of the present divisional application are believed to correspond to the proposed count. The assist the Examiner in this regard, Applicant includes Appendix B, C and D. Appendix B is a chart that provides an element-by-element recitation of the newly added claims of this application and an indication of the passages in the original application filed where, at the very least, the claims find support. Appendix D is a chart that provides a side-by-side comparison of allowed claim 15 of the '526 application with the proposed count.

V. CONCLUSION

Applicant respectfully requests that an interference be declared employing the proposed count set forth in Appendix A with claims 39-60 of this divisional application and claims 1-42 of the United States counterpart of International Application Number WO 99/42813, and designated as corresponding to the proposed count. Such action is respectfully requested.

Should any fees under 37 C.F.R. §§ 1.16 to 1.18 be required for any reason relating to the enclosed materials, or should an overpayment be included herein, the Commissioner is authorized to deduct or credit said fees from or to Gardere & Wynne, L.L.P. Deposit Account

No. 07-0153. The Examiner is invited to telephone the undersigned at the telephone number listed below if he or she has any questions or suggested amendments to the claims.

Dated this 2nd day of February, 2001.

Respectfully submitted:

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APPENDIX A

PROPOSED PHANTOM COUNT

1. An apparatus for catalyzing a reaction on a substrate comprising:

a light source;

a micromirror positioned to redirect light from said light source toward said substrate;

a computer connected to, and controlling, said micromirror; and

a reaction chamber is placed in the path of light redirected by said micromirror, wherein light that is redirected by said micromirror catalyzes a chemical reaction proximate said substrate in said reaction chamber.

APPENDIX B

APPLICATION OF CLAIM 39 OF THIS DIVISIONAL APPLICATION TO THE DISCLOSURE OF THE '526 APPLICATION

Claim 39 of this divisional application	**Disclosure in this application. Pg. 5, ll. 7-12.**
Apparatus for use in synthesis of arrays of DNA probes, polypeptides, and the like, comprising:	The method may also comprise the steps of positioning a substrate with a reaction chamber, flooding the surface of the substrate with a light catalyzable reaction chemical, such as a nucleotide or amino acid residue, and exposing the chemicals reagents light. Pg. 7, ll. 4-9.
(a) a substrate with an active surface on which the arrays may be formed;	More particularly, the present invention can be an apparatus for catalyzing a reaction on a substrate comprising... Pg. 5, ll. 7-12.
(b) an image former providing a high precision, two-dimensional light image projected onto the substrate active surface, comprising:	a light source that is directed toward a micromirror positioned to redirect light... Pg. 5, ll. 7-12.
(1) a light source providing a light beam;	from the light source toward a substrate. Pg. 5, ll. 7-12.
(2) a micromirror device receiving the light beam from the source and formed of an array of electronically addressable micromirrors, each of which can be selectively tilted between one of at least two separate positions, wherein in one of the positions of each micromirror the light from the source incident upon the micromirror is deflected away from an optical axis and in a second of the at least two positions of the micromirror the light is reflected along the optical axis; and	A computer is connected to, and controls, the micromirror and a substrate holder, such as a reaction chamber, that is placed in the path of light redirected by the micromirror, wherein light that is redirected by the micromirror catalyzes a chemical reaction proximate the substrate. Pg. 5, ll. 7-12.
(3) projection optics receiving the light reflected from the micromirrors along the optical axis and imaging the pattern of the micromirrors onto the active surface of the substrate.	By proximate it is meant that the light catalyzed reaction can occur on or about the surface of the substrate. Pg. 5, ll. 7-12.

APPENDIX C

COMPARISON OF CLAIM 1 OF THE WO 99/42813 APPLICATION WITH THE PROPOSED COUNT

Claim 1 WO 99/42813	**PROPOSED COUNT**
Apparatus for use in synthesis of arrays of DNA probes, polypeptides, and the like, comprising:	An apparatus for catalyzing a reaction
(a) a substrate with an active surface on which the arrays may be formed;	on a substrate comprising:
(b) an image former providing a high precision, two-dimensional light image projected onto the substrate active surface, comprising:	a micromirror positioned to redirect light from said light source toward said substrate;
(1) a light source providing a light beam;	a light source;
(2) a micromirror device receiving the light beam from the source and formed of an array of electronically addressable micromirrors, each of which can be selectively tilted between one of at least two separate positions, wherein in one of the positions of each micromirror the light from the source incident upon the micromirror is deflected away from an optical axis and in a second of the at least two positions of the micromirror the light is reflected along the optical axis; and	a computer connected to, and controlling, said micromirror; and
(3) projection optics receiving the light reflected from the micromirrors along the optical axis and imaging the pattern of the micromirrors onto the active surface of the substrate.	a reaction chamber is placed in the path of light redirected by said micromirror, wherein light that is redirected by said micromirror catalyzes a chemical reaction proximate said substrate in said reaction chamber.

APPENDIX D

COMPARISON OF ALLOWED CLAIM 15 OF THE '526 APPLICATION WITH THE PROPOSED COUNT

Claim 15 of 09/326,526	**PROPOSED COUNT**
Apparatus for use in synthesis of arrays of DNA probes, polypeptides, and the like, comprising:	An apparatus for catalyzing a reaction
(a) a substrate with an active surface on which the arrays may be formed;	on a substrate comprising:
(b) an image former providing a high precision, two-dimensional light image projected onto the substrate active surface, comprising:	a micromirror positioned to redirect light from said light source toward said substrate;
(1) a light source providing a light beam;	a light source;
(2) a micromirror device receiving the light beam from the source and formed of an array of electronically addressable micromirrors, each of which can be selectively tilted between one of at least two separate positions, wherein in one of the positions of each micromirror the light from the source incident upon the micromirror is deflected away from an optical axis and in a second of the at least two positions of the micromirror the light is reflected along the optical axis; and	a computer connected to, and controlling, said micromirror; and
(3) projection optics receiving the light reflected from the micromirrors along the optical axis and imaging the pattern of the micromirrors onto the active surface of the substrate.	a reaction chamber is placed in the path of light redirected by said micromirror, wherein light that is redirected by said micromirror catalyzes a chemical reaction proximate said substrate in said reaction chamber.